**物件導向程式設計**

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| **題目名稱(中文/英文)：Playfair Cipher** |
| **主要測試觀念：**   |  |  | | --- | --- | | **Basics** | **Functions** | | ■ C++ BASICS  □ FLOW OF CONTROL  ■ FUNCTION BASICS  □ PARAMETERS AND OVERLOADING  ■ ARRAYS  □ STRUCTURES AND CLASSES  □ CONSTRUCTORS AND OTHER TOOLS  □ OPERATOR OVERLOADING, FRIENDS, AND REFERENCES  ■ STRINGS  □ POINTERS AND DYNAMIC ARRAYS | □ SEPARATE COMPILATION AND NAMESPACES  □ STREAMS AND FILE I/O  □ RECURSION  □ INHERITANCE  □ POLYMORPHISM AND VIRTUAL FUNCTIONS  □ TEMPLATES  □ LINKED DATA STRUCTURES  □ EXCEPTION HANDLING  ■ STANDARD TEMPLATE LIBRARY  □ PATTERNS AND UML | |
| **題目說明：**  The Playfair cipher is a manual symmetric encryption technique. Write a program to encrypt the plaintext using Playfair cipher. To implement the Playfair cipher, you need to do two steps below:   * Generate the key table. * Encrypt the plaintext.   To generate the key table, one would first fill in the spaces in the table with the letters of the keyword (dropping any duplicate letters), then fill the remaining spaces with the rest of the letters of the alphabet in order, and put both "I" and "J" in the same space. (You can simply regard "J" as "I".)  **Example**:  Keyword(key) : **PLAYFAIREXAMPLE**   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **P** | **L** | **A** | **Y** | **F** | | **I/J** | **R** | **E** | **X** | **M** | |  |  |  |  |  | |  |  |  |  |  | |  |  |  |  |  |   First, put the letters of the keyword in the top rows of the table, from left to right, and dropping any duplicate letters.   |  |  |  |  |  | | --- | --- | --- | --- | --- | | **P** | **L** | **A** | **Y** | **F** | | **I/J** | **R** | **E** | **X** | **M** | | **B** | **C** | **D** | **G** | **H** | | **K** | **N** | **O** | **Q** | **S** | | **T** | **U** | **V** | **W** | **Z** |   Then fill the remaining spaces with the rest of the letters of the alphabet in order.  To encrypt a message, one would break the message into digrams (groups of 2 letters) such that, for example, “**HelloWorld**” becomes “**HE LL OW OR LD**”.  If **both** **letters are the same** or **only one letter is left**, add an “**X**” after the first letter, so “**HE LL OW OR LD**” should be “**HE LX LO WO RL DX**”.  For each digrams, please follow the rules below to encrypt plaintext:   1. If the letters are in the same **column** of the key table:   Move each letter down one. Upon reaching end of table, wrap around.   1. If the letters are in the same **row** of the key table:   Move each letter right one. Upon reaching end of table, wrap around.   1. If the letters are form into a **rectangle** in the key table:   Swap the letters with the ones on the end of the rectangle.  Playfair Cipher 01 HI to BM.pngPlayfair Cipher 02 DE to OD.png  Playfair Cipher 03 TH to ZB.png Playfair Cipher 10 EX to XD.png  *(Quoted from the Wikipedia.)*  More encrypting examples:   |  |  | | --- | --- | | For the pair of letters “**RN**”, we can get the new encoded text “**CU**” by following rule 1. | RN=>CU | | For the pair of letters “**UR**”, we can get the new encoded text “**LC**” by following rule 1. | UR=> LC | | For the pair of letters “**CG**”, we can get the new encoded text “**DH**” by following rule 2. | CG => DH | | For the pair of letters “**YF**”, we can get the new encoded text “**FP**” by following rule 2. | YF => FP | | For the pair of letters “**HE**”, we can get the new encoded text “**DM**” by following rule 3. | HE => DM | | For the pair of letters “**LO**”, we can get the new encoded text “**AN**” by following rule 3. | LO => AN |   **輸入說明：**  Given a **plaintext** and a **key**, encrypt the given text using Playfair Cipher. Both of the **plaintext** and **the key** only consists of lowercase letters. The plaintext **will not** contain two ‘x’s following each other, or an ‘x’ as the last character.  **輸出說明：**  Output the ciphertext encrypted by plaintext and key.  **IO範例 :**   |  |  |  | | --- | --- | --- | |  | **Sample Input** | **Sample Output** | | 第一組測資與輸出 | helloworld  playfairexample | dmyranvqcrge |  | | 第二組測資與輸出 | ntustcsie  objectorientedprogramming  hidethegoldinthetreestump  playfairexample | drkupoqeiy  bmodzbxdnabekudmuixmmouvif | | … | … | … | |
| **附屬資料︰**  🗹 解答程式： 03\_PlayfairCipher.cpp  🗹 測試資料：input1.txt, output1.txt, input2.txt, output2.txt, input3.txt, output3.txt |
| □易，僅需用到基礎程式設計語法與結構  □中，需用到多項程式設計語法與結構  ■難，需用到多項程式結構或較為複雜之資料型態或結構 |
| **解題時間： 40**分鐘。 |
| **其他註記：** |